NOAA's Potential Role in Renewable Energy

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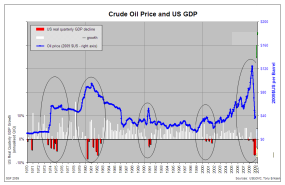
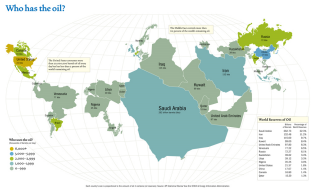
Rationale for Renewable Energy (RE)

- ❑ Economic Security
  - 85% of US energy use comes from fossil fuels - but these are limited resources
  - Possible peaks in global production
  - Net energy decreasing
  - Cost of fossil fuels are increasing
  - For oil, increased costs worsen trade imbalance
  - Strong correlation between high energy costs and economic recession in US
  - RE costs decreasing and creates jobs in the U.S.



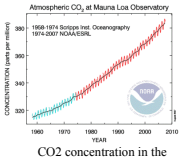
Oil price in constant dollars versus US GDP since 1970. Recession years are circled.

- ❑ National Security

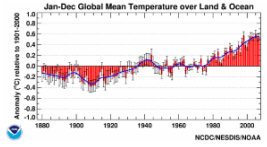


Map of world with country size scaled by its stated oil reserves

- ❑ Climate Change Mitigation



CO2 concentration in the atmosphere since 1958



Global average mean temperature anomaly since 1880

NOAA's Connection to Renewable Energy

- ❑ Most types of RE depend on atmosphere/ocean forcing
  - Wind Energy (wind speed, turbulence intensity, icing)
  - Solar Energy (clouds and aerosols, water availability)
  - Biofuels (precipitation and temperature)
  - Ocean Kinetic (waves, tides, currents)
  - Ocean Thermal (temperature profile)

- ❑ NOAA's observations, products, and services were not designed for RE
- ❑ NOAA also has mandate to provide stewardship of ocean ecosystems, which could be impacted by offshore RE development

Current status of Renewable Energy in NOAA

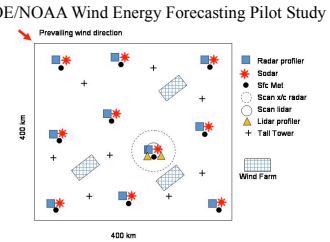
- ❑ NOAA presently has no funded, focused program to address RE issues

NOAA is assessing what it might do for RE:

- ❑ Outreach to the RE industry, DOE, academia
  - Understanding the needs of the RE industry
    - ✓ Industry & DOE have asked for NOAA's support
    - ✓ Ocean RE testimony to Congress
    - ✓ Private sector forecasters letter
    - ✓ AMS, AGU meetings
  - NOAA's products and services are insufficient for RE
- ❑ NOAA Strategic Energy Review
  - Determine all Line Office capabilities for RE
  - NOAA's role relative to other federal agencies
- ❑ One-NOAA Energy Initiative
  - Grass-roots effort to infuse RE into research and operations
  - Spans most NOAA Line Offices and programs

Renewable Energy Science Plans in PSD/GSD

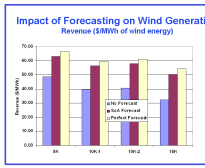
- ❑ Climate
  - Observations
    - ✓Climate reference network for wind and solar
  - Analysis
    - ✓Dependence of RE resources on climate drivers
    - ✓Impact of long-term changing climate on RE resources
    - ✓Impact of RE on climate
  - Forecasts
    - ✓Seasonal to annual forecasts of RE potential
- ❑ Weather
  - Observations
    - ✓ Wind and Solar Energy Testbeds
    - ✓ Buoy-based offshore wind profiling
    - ✓ Instrument validation
    - ✓ National Network of Networks for RE
  - Model improvements
    - ✓ Better physical parameterizations of PBL , clouds
  - Forecasts
    - ✓ National High Resolution Rapid Refresh Model



Conceptual base-map from a 2010-2011 DOE/NOAA Pilot Study for Wind Energy Forecasting

Potential Impacts of NOAA's Contributions

- ❑ On the RE community
  - Reduce costs of RE
  - Increase grid stability (planning and operation)
  - Increase IQ of the Smart Grid
    "The Smart Grid can't be smart without improved weather forecasts." - Henry Kelly, DOE, Principal Assistant Secretary for the Office of EERE
  - Help private sector provide better products
- ❑ Help mitigate climate change by reducing carbon emissions



GE study on wind forecasting shows three billion dollars could be saved annually under 20% wind scenario by improving wind speed forecasts

Summary

For economic, national security, or climate change reasons, the future U.S. energy system will rapidly evolve to include more renewable energy production, much of which will depend on atmospheric and oceanic resources. *NOAA's observations, forecasts, and analyses will play a strategic role in the planning and operation of this system.* PSD and GSD both have important roles to play within NOAA for improving the climate and weather information required to make the transition to RE a reality.